NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
**RESEARCH AND TECHNOLOGY RESUME**

TITLE

Radar Observations of the Inner Solar System

PERFORMING ORGANIZATION

Jet Propulsion Laboratory
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INVESTIGATOR'S NAME

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DESCRIPTION *(a. Brief statement on strategy of investigation; b. Progress and accomplishments of prior year; c. What will be accomplished this year, as well as how and why; and d. Summary bibliography)*

a. **Strategy**: Goldstone radar observations of Mars, Venus, Mercury, and the Moon, including high-resolution delay/Doppler mapping, altimetry, and dual-polarization observations designed to provide information about those bodies' surfaces that is new and is unlikely to be provided by upcoming space missions. Concurrent objectives involve dynamical information: maintenance of Mars ephemeris accuracy, Mercury "closure-point" ranging for relativity theory testing, and refinement of spin-vector estimates for Venus and Mercury. This task has been renamed to reflect accurately the research it supports.

b. **Accomplishments**: The backlog of unprocessed Venus data has been sharply reduced; most images from the 1980-82 conjunctions, and half of those from 1986, are essentially finished. Articles reporting selected results (e.g., identification of very highly relecting materials in the lowland plains) are reported by Jurgens et al.(1988, *Science* **240**, 1021-1023; and *Geophys. Res. Lett.*, in press). Suitably formatted data have been distributed to (non-JPL) scientific collaborators for geologic analysis, and to the Magellan project.

c. **Anticipated Accomplishments**: (1) Mars range/Doppler observations planned for the closest opposition until 2003 will provide altimetric profiles and Hagfors slope and reflectivity parameters at latitudes from -19° to -24°, and dual-polarization, 13.5-cm spectral measurements will elucidate the global variations in the surface's small-scale structural complexity (i.e., "roughness"). (2) For Venus, up to 11 images of previously unmapped equatorial regions (inaccessible to Arecibo) will be acquired at near-normal incidence angles (i.e., with a viewing geometry very different from the typically ~30° for Magellan). The best resolution in these images will be ~1 km. (3) For Mercury, in addition to ranging for orbital parameter refinement in an ongoing program, we propose radar mapping of portions of the unimaged hemisphere of Mercury at resolutions ~10 km. (4) Acquisition of high-resolution (~100-m) reflectivity imaging and altimetry data for the Moon at the Magellan wavelength (13 cm).

**d. Publications**:

Clark, P. E., M. A. Leake, and R. F. Jurgens (1988). Goldstone Radar Observations of Mercury. In Mercury (C. R. Chapman and F. Vilas, eds.), Univ. of Arizona Press, in press.

Jurgens, R. F., M. A. Slade, L. Robinett, S. Brokl, G. S. Downs, C. Franck, G. A. Morris, K. H. Farazian, and F. P. Chan (1988). High-Resolution Images of Venus from Ground-Based Radar. Geophys. Res. Lett., in press.

Jurgens, R. F., M. A. Slade, and R. S. Saunders (1988). Evidence for Highly Reflecting Materials on the Surface of Venus. Science **240**, 1021-1023.

Roth, L. E., R. S. Saunders, G. S. Downs, and G. Schubert (1988). Radar Altimetry of Large Martian Craters. Submitted to Icarus.